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Additional inventors are being named on the _____ separately numbered sheets attached hereto					
TITLE OF THE INVENTION (500 characters max)					
LMSD EARLY RINGBACK IN HOME MSCE					
Direct all correspondence to: CORRESPONDENCE ADDRESS					
<input checked="" type="checkbox"/> Customer Number:		021498			
OR					
<input type="checkbox"/> Firm or Individual Name					
Address					
Address					
City		State		Zip	
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ENCLOSED APPLICATION PARTS (check all that apply)					
<input checked="" type="checkbox"/> Specification Number of Pages 8		<input type="checkbox"/> CD(s), Number _____			
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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.					
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Respectfully submitted,

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[Page 1 of 2]

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Number ONE of ONE

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Provisional Patent Application

Title:

LMSD Early Ringback in Home MSCe

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LMSD Early Ringback in Home MSCe

1. Problem Statement

Due to the length of time required to Page the mobile, for call delivery, it is sometimes advantageous to send back to the caller a Ringback signal as soon as possible. For 3GPP2 LMSD Step-2 when the call origination message received by the Home Network is an ISUP IAM message there is no defined procedure as to how early ringback would be accomplished.

2. Invention

When the call origination message received by the 3GPP2 LMSD Home Network is an ISUP IAM message this invention addresses:

1. How the LMSD Serving MSCe can signal the LMSD Home MSCe to initiate early ringback.
2. How the LMSD Serving MSCe signals the LMSD Home MSCe to discontinue early ringback.
3. How and when the LMSD Serving MSCe is allowed to provide Ringback.

For this invention “early ringback” is defined as a ringback signal to the caller that occurs before the mobile has answered the page.

The call flow below describes the complete LMSD Step-2 call setup signaling procedure when the call origination message received by the Originating Network is an ISUP IAM message. Note “Home Network” is sometimes referred to as the “Originating Network” for Call Delivery scenarios.

- The mechanism for how the LMSD Serving MSCe signals the LMSD Home MSCe to initiate early ringback is given in steps 11, 14, and 15.
- The mechanism for how the LMSD Serving MSCe signals the LMSD Home MSCe to discontinue early ringback is given in steps 22, 24, and 25.
- The mechanism for how and when the LMSD Serving MSCe is allowed to provide Ringback is given in steps 20 and 21.

LMSD Call Delivery to an Idle MS on another MSCe (PSTN)

This scenario describes call delivery to an MS that is outside the serving area of the MSCe where the call originates. MSCe in the functional model described in Section X.X must interact with their associated HLR and VLR to obtain database information for an MS. The call origination message received by the Home Network is an ISUP IAM message.

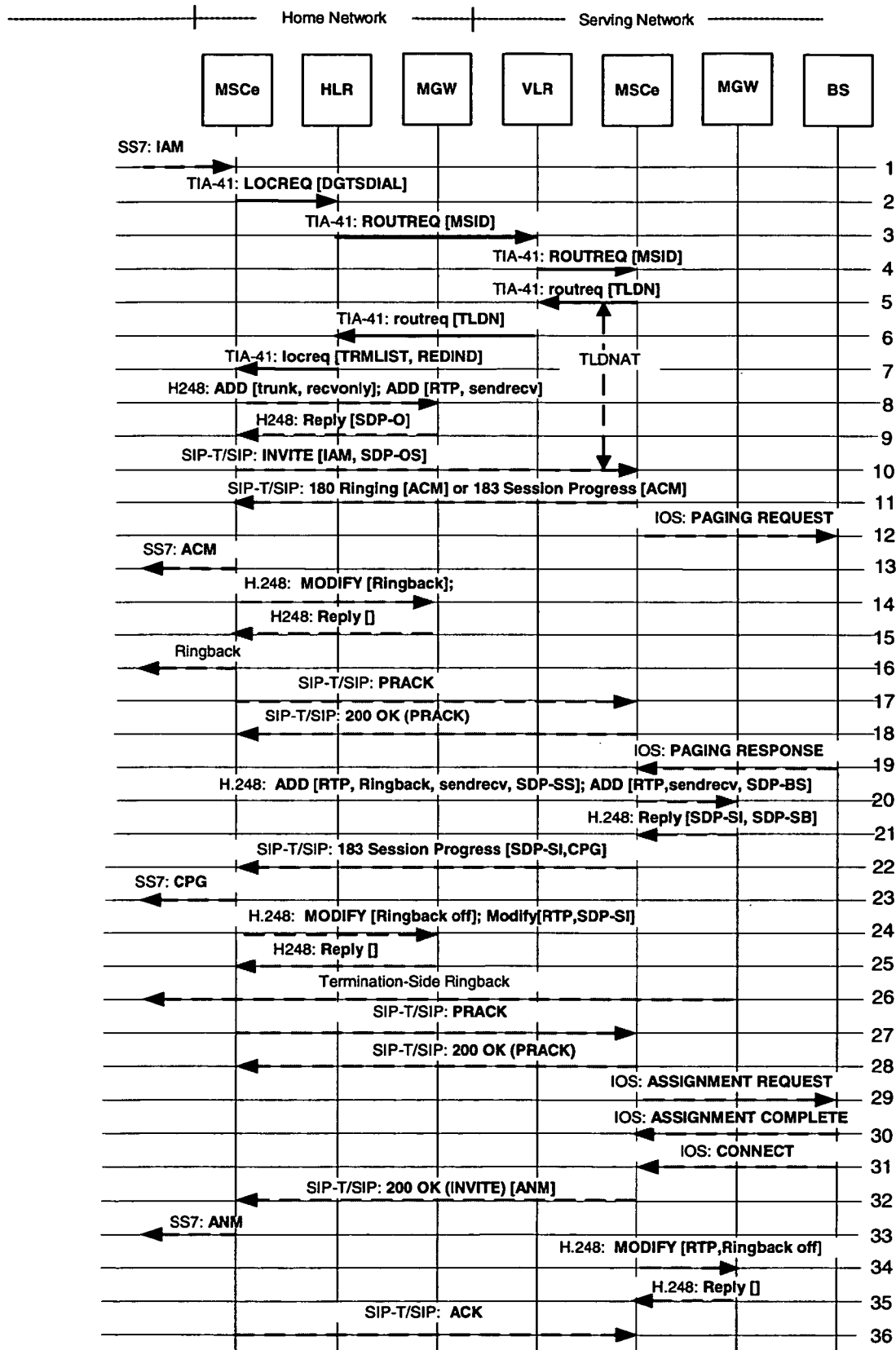


Figure X-1: LMSD Call Delivery to an Idle MS on another MSCe (PSTN)

1. A call origination and the dialed MS address digits (i.e., directory number) are received by the Home MSCe.
 2. The Home MSCe sends a *LOCREQ* [41-1] to the HLR associated with the MS; this association is made through the dialed MS address digits (which may not be the MIN).
 3. If the dialed MS address digits are assigned to a legitimate subscriber, the HLR sends a *ROUTREQ* [41-1] to the VLR where the MS is registered.
 4. The VLR then forwards the *ROUTREQ* to the current Serving MSCe.
In reaction to the *ROUTREQ* the Serving MSCe consults its internal data structures to determine if the MS is already engaged in a call on this MSCe.
 5. The Serving MSCe allocates a TLDN (Temporary Local Directory Number) and returns this information to the VLR in the *routreq* [41-1]. The Serving MSCe starts timer TLDNAT.
 6. The VLR sends the *routreq* to the HLR.
 7. When the *routreq* is received by the HLR, it returns a *locreq* [41-1] to the Home MSCe. The *locreq* includes routing information in the form of the *TerminationList* parameter [41-1], along with an indication of the reason for extending the incoming call (i.e., for CD) in the *DMH_RedirectionIndicator* parameter [41-1].
- The Home MSCe translates the TLDN to an IP address/UDP Port number and a SIP URI for the Serving MSCe.
8. The Home MSCe establishes a context with a Home MGW. The H.248 message consists of two *ADD* commands. The first *ADD* command establishes a termination to the PSTN communication channel (e.g., DS0 on a T1 or E1 line) that corresponds to the incoming *IAM* (Initial Address Message) with a mode set to *recvnly*. The termination is set to this mode for fraud prevention. The second *ADD* command establishes a termination for a bearer channel using RTP.
 9. The Home MGW replies to the H.248 message. The *Reply* message contains the SDP-O, the local SDP for the Home MGW. SDP-O contains an IP address, a UDP Port number, and a list of Codecs that the Home MGW supports for sending and receiving.
 10. The Home MSCe sends an *INVITE* [RFC3261] message to the Serving MSCe containing the *IAM* message and SDP-OS. SDP-OS may be identical to SDP-O (e.g., the Home MSCe may elect to modify SDP-O). The Serving MSCe will use the TLDN to make the association with the MSID received in the *ROUTREQ* message (Step-4).

11. The Serving MSCe shall send either a *180 Ringing* [RFC3261] [RFC3272] message or a *183 Session Progress* [RFC3261] message to the Home MSCe. The message contains an ACM. If the Serving MSCe elects to initiate early ringback then a *180 Ringing* message is sent, otherwise a *183 Session Progress* [RFC3261] [RFC3272] message is sent.
 12. After receiving an *INVITE* message (Step-10) the Serving MSCe sends a *Paging Request* message to the BS to initiate a mobile terminated call setup scenario. The *Paging Request* message contains the "Desired Codec" for the terminated mobile. How the Serving MSCe selects the "Desired Codec" is outside the scope of this document.
 13. The Home MSCe sends an *ACM* back towards the originating exchange.
 14. If the Home MSCe received a *180 Ringing* message (Step 11), the Home MSCe sends an H.248 message containing a *MODIFY* command to the Home MGW. The *MODIFY* command initiates early Ringback for the termination towards the originating exchange.
 15. The Home MGW acknowledges the H.248 message with a *Reply* message.
 16. If Ringback from the Home MGW is initiated then early Ringback is sent towards the originating exchange.
 17. The Home MSCe sends a *PRACK* message to the Serving MSCe.
 18. The Serving MSCe sends a response to the *PRACK* message to the Home MSCe.
 19. The BS constructs the Paging Response message, places it in the Complete Layer 3 Information message, and sends the message to the Serving MSCe. The Paging Response message contains the codec chosen by the terminating mobile, a list of available BS transcoders, and the connection information for the BS communications channel.
 20. The Serving MSCe establishes a context with a Serving MGW. The H.248 message consists of two ADD commands. The first ADD command establishes a termination for a bearer channel using RTP towards the IP Network. The mode is set to sendrecv. If the Serving MSCe elects to initiate Termination-Side ringback, then ringback from the termination is initiated. SDP-SS is the remote SDP containing the connection information for the IP network. SDP-SS may be identical to SDP-OS (e.g., the Serving MSCe may elect to modify SDP-OS).
- The second ADD command establishes a termination for the BS communication channel with a mode set to sendrecv. SDP-BS is the remote SDP containing the Serving BS connection information.
21. The Serving MGW replies to the H.248 message. The Reply message contains SDP-SI and SDP-SB. SDP-SI is the local SDP for the termination towards the IP network and contains the Serving MGW connection information for this termination. SDP-SB is the local SDP for the

1 termination towards the Serving BS and contains the Serving MGW
2 connection information for this termination.

3 22. The Serving MSCe sends the Home MSCe a 183 Session Progress
4 [RFC3261] message containing SDP-SI and an optional *CPG* message.
5 SDP-SI shall contain only one codec.

6 23. If a *CPG* message was sent in step 22 then the Home MSCe sends a *CPG*
7 back towards the originating exchange.

8 24. After receiving the 183 message (Step 22) the Home MSCe sends H.248
9 message containing either one *MODIFY* command (if Home MSCe
10 received a 183 Session Progress message in Step 10) or two *MODIFY*
11 commands (if Home MSCe received a 180 Ringing message in Step 10).
12 The first *MODIFY* command contains a remote SDP (i.e., SDP-SI). SDP-
13 SI is the remote SDP containing the connection information for the
14 Serving MGW.

15
16 The second *MODIFY* command (if present) terminates the early Ringback
17 from the Home MGW to the originating exchange.

18 25. The Home MGW acknowledges the H.248 message with a Reply
19 message.

20 26. If Ringback from the Serving MGW is initiated then Ringback is sent
21 towards the originating exchange.

22 27. After receiving the 183 message (Step 22) the Home MSCe sends a
23 *PRACK* message to the Serving MSCe.

24 28. The Serving MSCe sends a response to the *PRACK* message to the Home
25 MSCe.

26 29. After receiving the H.248 reply message (Step-18), the Serving MSCe
27 sends an Assignment Request message to the BS to request assignment of
28 radio resources. The Assignment Request message contains the Serving
29 MGW connection information, request of any BS transcoding (if
30 necessary) and the codec assignment for the terminating MS.

31 30. The BS sends the Assignment Complete message to the Serving MSCe.

32 31. The BS sends a Connect message to the Serving MSCe to indicate that the
33 call has been answered at the terminating MS.

34 32. After receiving the Connect message from the BS and the *PRACK*
35 message is received (Step 27), the Serving MSCe sends a 200 OK
36 message [RFC3261] [RFC3272] to the Home MSCe. The message
37 contains an ANM and acknowledges that the *INVITE* (Step-10) message
38 has succeeded

39 33. The Home MSCe sends an *ANM* back towards the originating exchange.

40 34. If the Serving MSCe elected to initiate Termination-Side ringback (Step
41 17), then the Serving MSCe will send a H.248 message to the Serving

MGW. The H.248 message contains a MODIFY command to deactivate the Ringback for the termination towards the IP Network.

35. The Serving MGW acknowledges the H.248 message with a Reply message.

36. In response to the 200 OK message (Step 32), a ACK [RFC3261] message is sent by the Home MSCe to the Serving MSCe

3. Abbreviations/Definitions

ADD	H.248 Command - The Add command adds a Termination to a Context. The Add command on the first Termination in a Context is used to create a Context.
BS	Base Station
CDMA	Code Division Multiple Access
Home Network	The Home Network of an MS to which the MS's Directory Number is assigned.
IOS	Interoperability Specification
IP	Internet Protocol – there are two version of IP, IPv4 (defined in IETF RFC 0791) and IPv6 (defined in IETF RFC 2460).
ISUP	ISDN (Intergrated Services Digital Network) Uers Part
LMSD	Legacy Mobile Station Domain
MODIFY	H.248 command - The Modify command modifies the properties, events and signals of a Termination.
MS	Mobile Station
MSCe	Mobile Switching Center emulation
MGW	Media GateWay
Reply	Reply to a H.248 command
RTP	Real-Time Transport Protocol (defined in IETF RFC 1889)
SDP	Session Description Protocol (defined in RFC 2327)
Serving Network	The network in which the terminal device (e.g., MS) is currently registered.
SIP	Session Initiation Protocol (defined in RFC 3261)

1

TLDN Temporary Local Directory Number

VLR The Visitor Location register (VLR) is the location register other than the HLR used by an MSCe to retrieve information for handling of calls to or from a visiting subscriber. The VLR may, or may not be located within, and be indistinguishable from an MSCe. The VLR may serve more than one MSCe.

2

3

4 What is claimed is:

5

6 1. A method for providing early ringback to an originating terminal in an LMSD
7 network, having a control interface and a bearer interface comprising, the steps of:

8

9 a) sending on a control interface a signal indication that a call is being originated;

10 b) receiving on the control interface in response to the call origination indication
11 signal a message authorizing creation of an early ringback signal to the
12 originating terminal;

13 c) creating and sending an early ringback signal to the originating terminal on the
14 bearer interface;

15 d) receiving on the control interface an indication to stop the early ringback
16 signal on the bearer interface and to transmit to the originating terminal the
17 signals received on the bearer interface.